Forward Spectrometer and FLUKA Simulation Update

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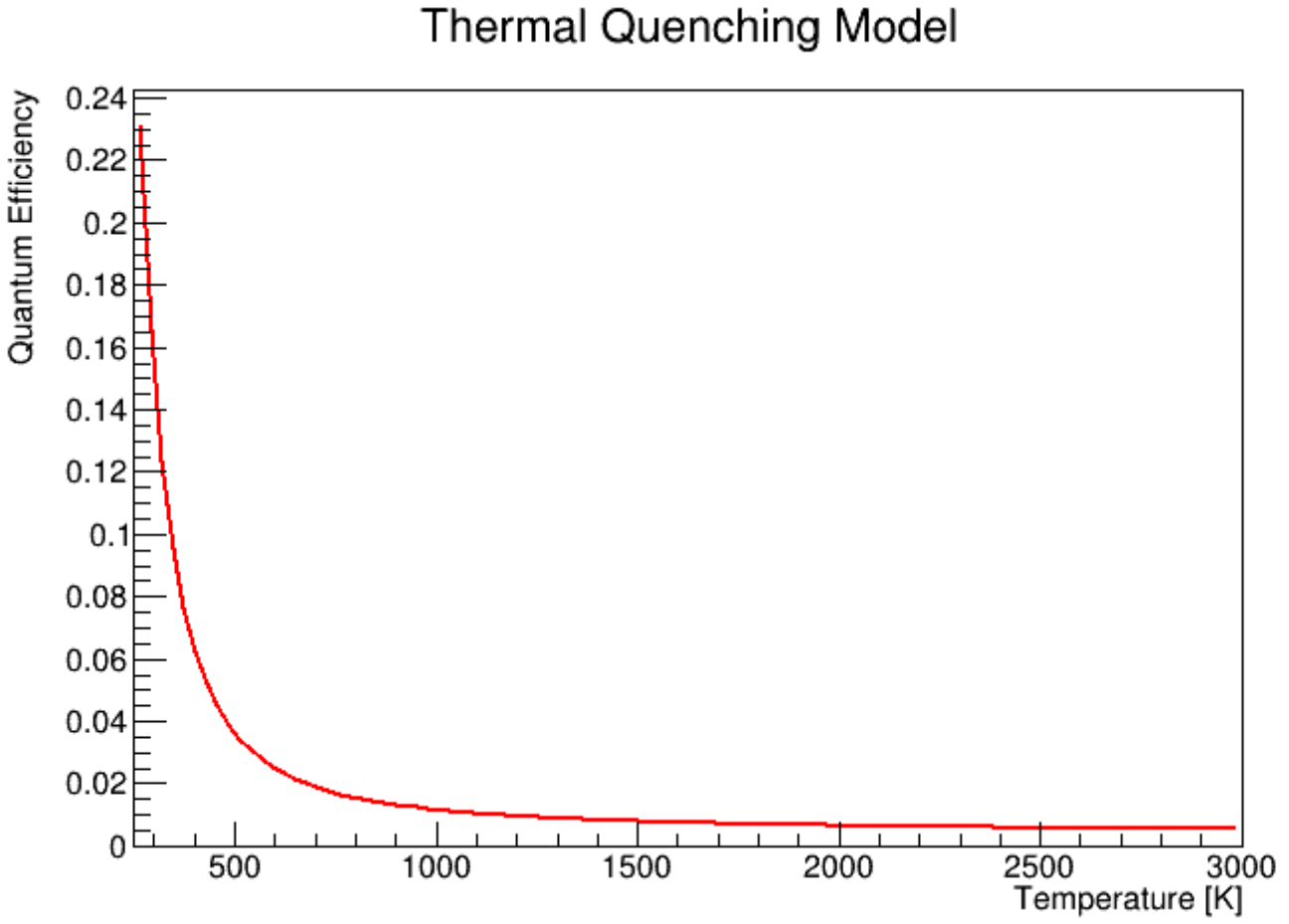
Profiler Status

- Little information on scintillation response of LANEX at GeV level and at temperatures anticipated
- Quantum efficiency of scintillator obeys

$$QE = \frac{1}{1 + Ce^{-E/kT}}$$

- C is a dimensionless constant, T is temperature and E is a transition energy
- At ~300 K, QE = 0.15 and assume E ~ 0.1 eV (peak emission wavelength 510 nm $\rightarrow$ 2.44 eV) – this gives C = 270.05

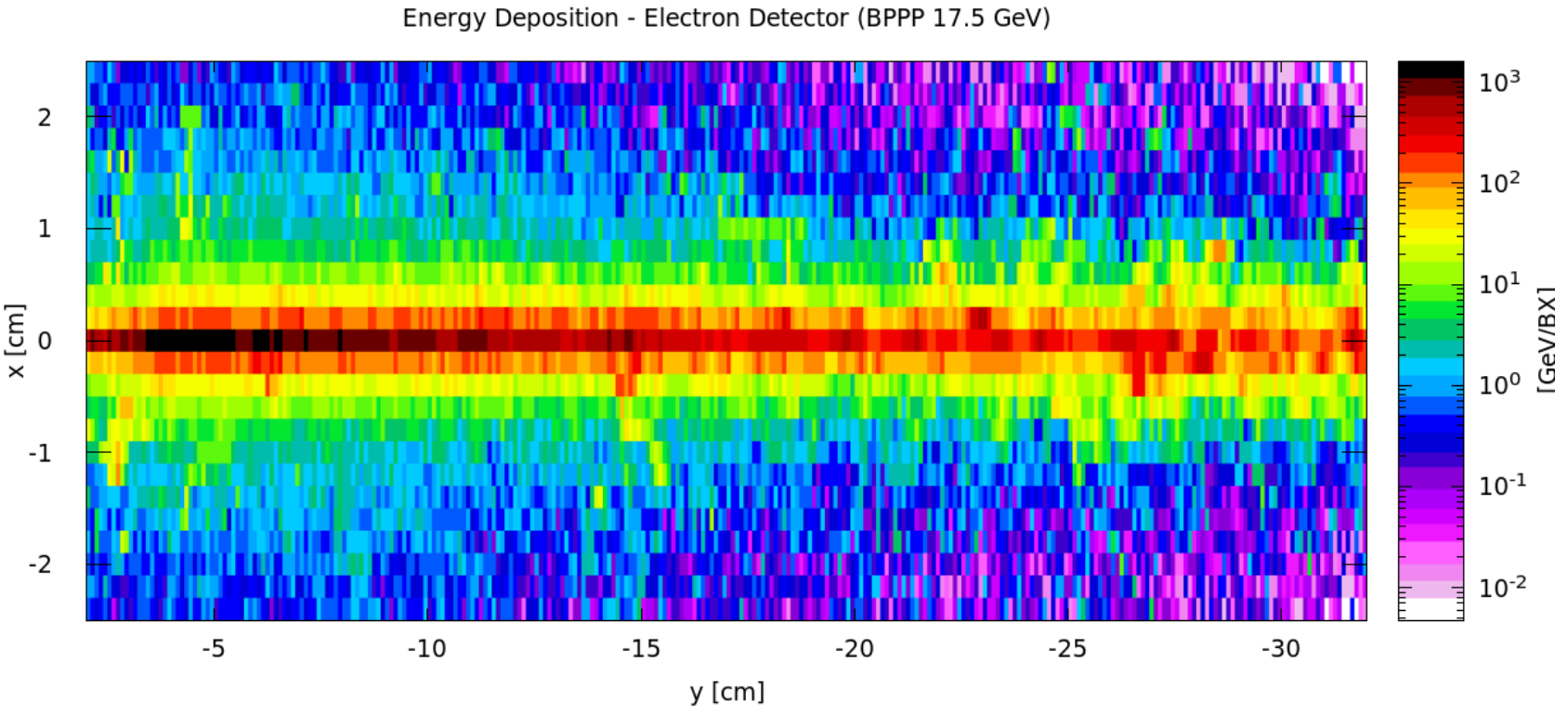
Model of Thermal Quenching



Alternative Method

- Use spreading of electrons/positrons in plane perpendicular to magnetic dispersion
- Divergence should be unaffected in this plane – possible to calculate it?
- If so, profiler may not be need
- More work needs to be done to test this

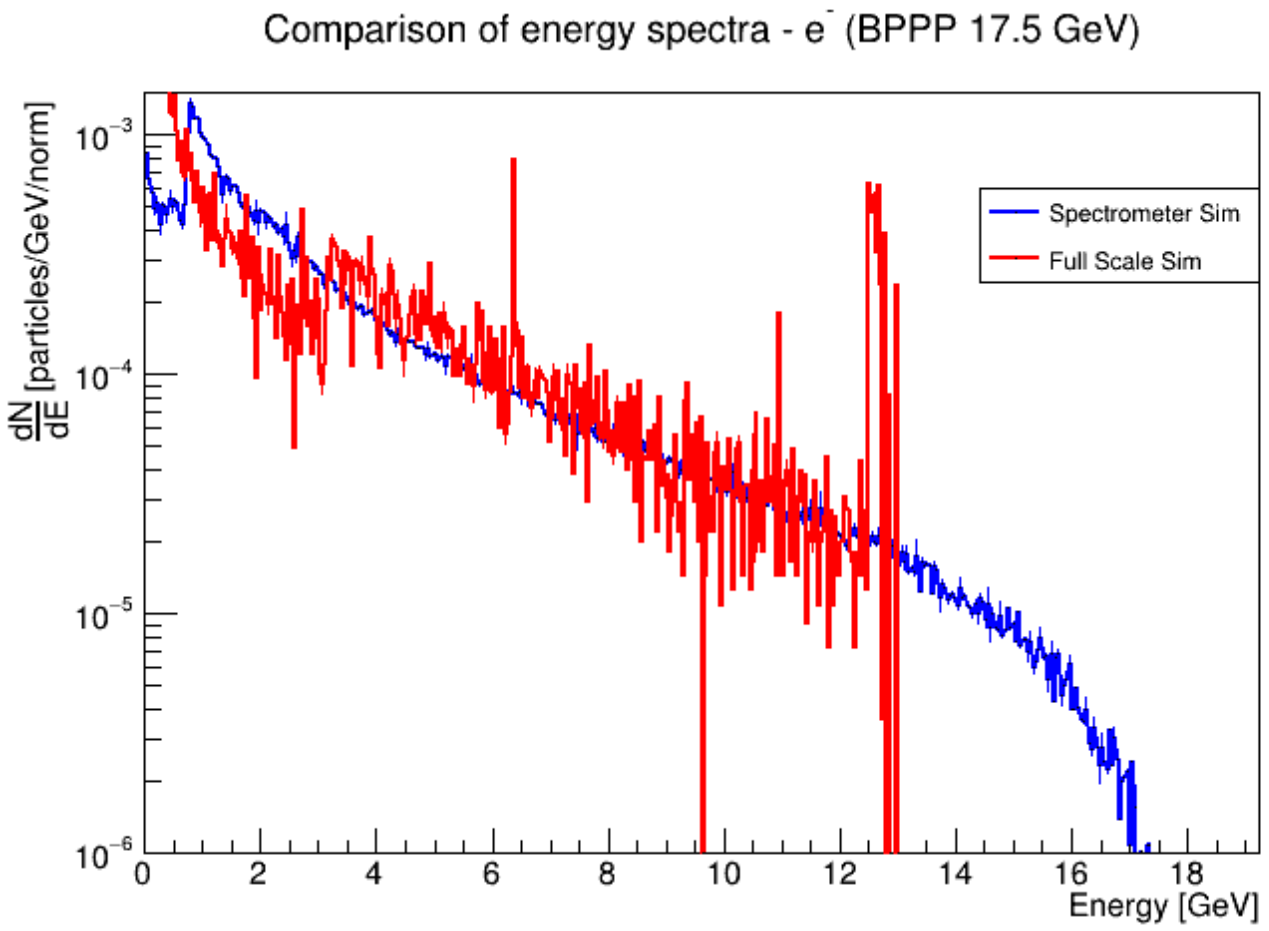
Electron Detector Deposition

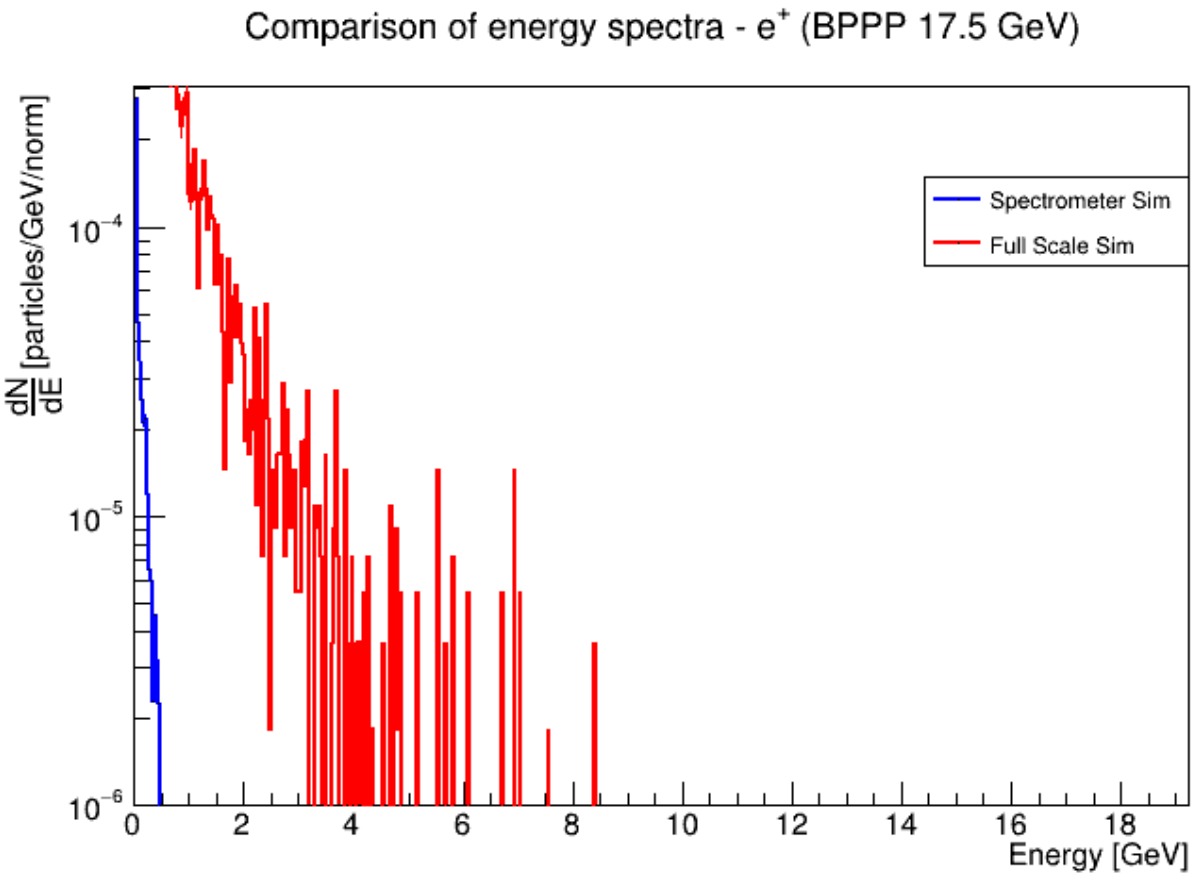


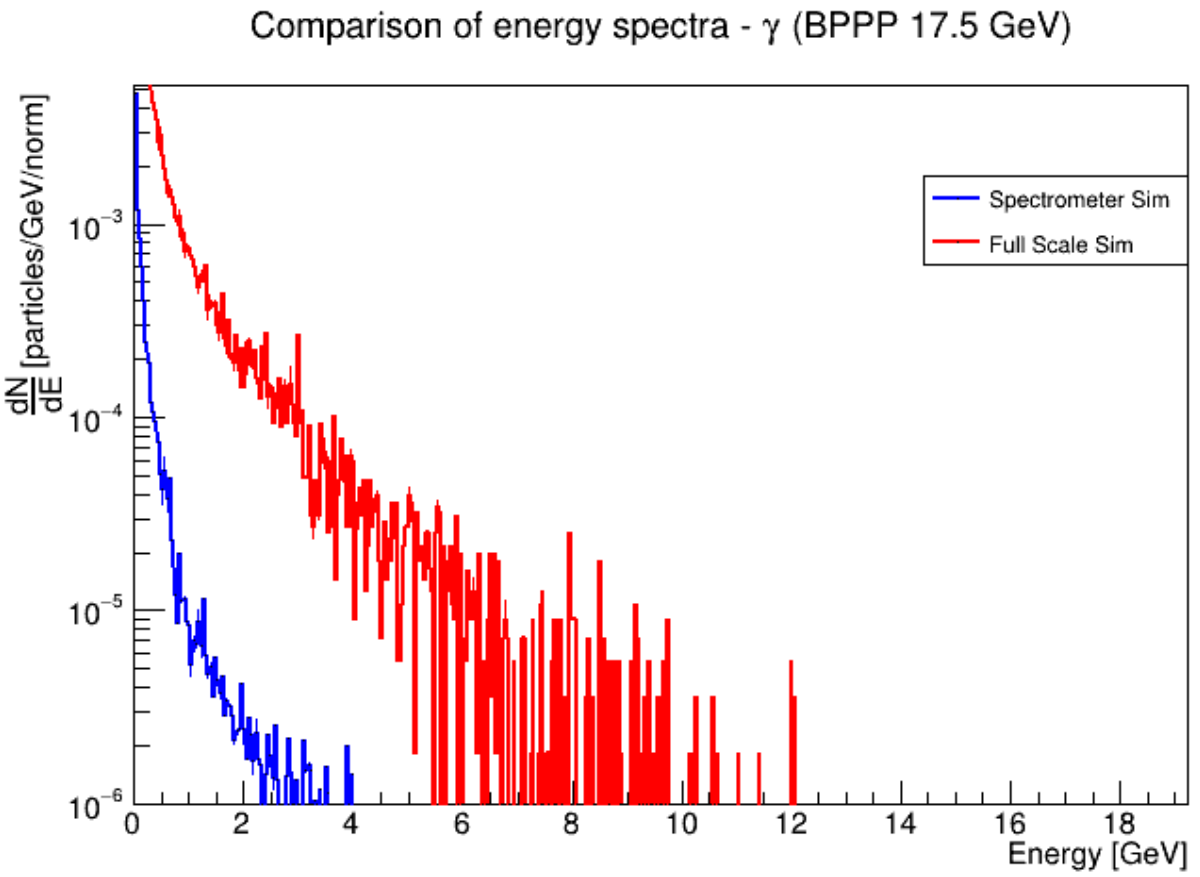
Divergence Calculation

- Width of central streak ~ 1 pixel = 0.2 cm
- Distance from IP = 1300 cm
- Vertical divergence is 150 urad
- Expected to be ~50 urad
- 3 times too large – may require finer segmentation of detector screens (possible with LANEX)
- Needs more work – very rough calculation!

FLUKA Simulation




Comparison of energy spectra - e+ (BPPP 17.5 GeV)
dN/dE [particles/GeV/norm]
10−4
10−5
10−6
0
2
4
6
8
10
12
14
16
18
Energy [GeV]
Spectrometer Sim
Full Scale Sim


Comparison of energy spectra - γ (BPPP 17.5 GeV)
Spectrometer Sim
Full Scale Sim
dN/dE [particles/GeV/norm]
10^-3
10^-4
10^-5
10^-6
0
2
4
6
8
10
12
14
16
18
Energy [GeV]